

STUDIES IN Machaerium (LEGUMINOSAE) V.

History and Fossil Names

Velva E. Rudd

Smithsonian Institution, Washington, D. C. 20560

California State University, Northridge, Ca. 91330

A treatment of the genus Machaerium has long been scheduled for Flora Neotropica but as more collections become available more problems appear. For that reason it seems prudent to continue with interim reports and present some of the uncertainties that can best be resolved by persons in the areas where they can study the plants in the field as well as in the herbarium.

History

The genus Machaerium was established by Persoon in 1807 to include three species that he separated from Nissolia: M. ferrugineum (Willd.) Pers., M. punctatum (Poir.) Pers., and M. reticulatum (Poir.) Pers. He retained in Nissolia two species; N. fruticosa Jacq., now conserved as the type of Nissolia, and N. arborea Jacq., later transferred to Machaerium by Vogel.

Medicus, some 20 years earlier, in 1787, had published two genera; Quinata, based on Nissolia quinata Aubl., which is also the basionym of N. ferruginea Willd.; and Nissolius, based on Nissolia arborea Jacq. These two genera, Quinata Medic. and Nissolius Medic., were proposed and recommended for rejection vs. conservation of Machaerium Pers. (Taxon 18: 593. 1969; 20: 388; 1971). By action of the 12th International Botanical Congress at Leningrad in 1975, Machaerium Pers. was approved for conservation.

In 1820, one species was added to the genus, Machaerium aculeatum Kaddi, and in 1824, another, M. acuminatum H.B.K. A new variety, M. ferrugineum var. glabrescens E. Meyer, was also published in 1824 but subsequently ignored. The type has not been located and there is some question as to the taxon's being referable to Machaerium.

De Candolle, in 1825, reduced Machaerium to a section of Nissolia with the comment, "An genus proprium?". He included in the section only two species previously referred to Machaerium, M. ferrugineum and M. acuminatum, but added two of Poiret's species of Nissolia, N. polyphylla and N. microptera and three new species, N. diadelphica DC., N. leiophylla DC., and N. robiniaefolia ("robiniaefolia") DC. Persoon's remaining species of Machaerium, M. punctatum (as N. stipitata DC.), and M. reticulatum, both originally cited as from Madagascar, were relegated, under Nissolia, to "Species non satis notae". In his "Memoirs sur le famille des légumineuses" (1826, p. 270), de Candolle stated that for the present he preferred to reunite all the species of Nissolia into one genus but, perhaps, one day when the species were better known, the opinion of Persoon, dividing Nissolia into two genera, would be adopted.

Vellozo, in his *Flora Fluminenses* (Text 1825; Icones 1831), published 14 species of Nissolia, 11 of which are now referred to Machaerium.

Vogel, in March 1837, in a paper "*Dalbergiearum Genera Brasiliensia*", again recognized Machaerium as a separate genus and published 22 new species and an additional two varieties. In a following paper, in April-June, another species was published. The taxa were divided into two groups without formal designation as I. Inermes and II. Armatae.

More or less simultaneously, Bentham was working on South American legumes and, in June 1837, published his "*Commentationes de Leguminosarum Generibus*". Later, in 1839, it appeared as "*De Leguminosarum Generibus Commentationes*" in *Ann. Wiener Mus.* 2: 61-142. A total of 51 species of Machaerium were included, followed by a half dozen names of Nissolia cited as "*Species valde dubiae sunt.*" On the basis of leaf venation and stipule characters the species were grouped into three unnamed categories.

In the course of the next two decades another dozen or so species of Machaerium were published by various authors. The most comprehensive treatment of the genus in the nineteenth century was by Bentham in his "*A Synopsis of the Dalbergieae*" (*Jour. Linn. Soc.* 4, suppl.: 52-71. 1860). In this paper, a byproduct of the work for Martius's "*Flora Brasiliensis*" which appeared two years later, all species known to date were assessed. After some reduction to synonymy and transfer to other genera, a total of 56 species remained. Four doubtful species of Nissolia; N. dubia Poir., N. microptera Poir., N. retusa Willd., and N. reticulata Lam., were noted as "probably synonyms to some of the *Machaeria* above enumerated." Bentham divided Machaerium into five series: 1. Lineata; 2. Oblonga; 3. Acutifolia; 4. Reticulata, and 5. Penninervia, based chiefly on characters of the leaflets and whether the stipules were spinescent or not as in his earlier treatment. These five series were later given sectional status by Taubert (in *Engl. & Prantl, Naturl. Pflanzenfam.* 3: 337. 1894).

No new species of Machaerium were published until after 1900 when there was a resurgence of taxonomic interest in the genus. Noteworthy was Ducke's acceptance of the natural integrity of Machaerium and Drepanocarpus G. F. W. Meyer, and his transference of seven Brazilian species of Drepanocarpus to Machaerium.

In 1941 Hoehne published the first revision of the augmented genus with a total of 121 species of Machaerium (*Flora Brasílica* 25 (3). 1941). Included were 107 illustrations. Unfortunately, some types and other critical specimens were not available to him, and a number of problems continued to remain unsolved.

A division of the genus into "species series" on the basis of phytochemical characteristics was proposed by Oliveira, et al. in 1971 (Phytochem. 10: 1863-1876). Apparently, only eight species were considered, which were placed into two groups, the *Machaeria scleroxyla*, with three species: *M. scleropyllum* Tul., *M. nyctitans* (Vell.) Benth., as "*nyctitans*", and *M. kuhlmannii* Hoehne, and the *Machaeria villosa*, with five species: *M. villosum* Vog., *M. acutifolium* Vog., *M. mucronulatum* Mart., *M. opacum* Vog., and *M. vestitum* Vog. It is interesting to note that there is a correlation with the earlier treatments; the species of Oliveira's series *M. scleroxyla* fall into Bentham's series *Oblonga*, and those of the *M. villosa* series into Bentham's series *Reticulata*.

The history of *Drepanocarpus*, intended to comprise species with lunate fruit rather than alate, has run essentially parallel to that of *Machaerium*. The genus was described as new in 1818 by G. F. W. Meyer in his "Primitiae florae essequiboensis" and was based on *Pterocarpus lunatus* L.f. Three species were added in 1824; *D. dubius* H.B.K., *D. isadelphus* E. Meyer, and *D. microphyllus* E. Meyer, and one more in 1825; *D. cyathiformis* DC. The latter, based on one of the unpublished icones of Sessé and Mocíño, is, apparently, referable to *Dalbergia monetaria* L.f.

About 15 names, some synonyms, were added before 1860 when, in that year, Bentham (op. cit.) recognized eight species divided equally between two series, *Lineati* and *Reticulati*, which were comparable to his series *Lineata* and *Reticulata* of *Machaerium*. In addition, listed as doubtful, were *D. dubius* H.B.K., *D. cyathiformis* DC., *D. falcatus* Miq., and an undescribed species from Mexico, later published by Hemsley as *D. mucronulatus*, actually a synonym of *Aeschynomene amorphoides* (S. Wats.) Rose ex Robins. Bentham's treatment of *Drepanocarpus* in Martius's Flora Brasiliensis, with seven species and five illustrative plates, is interesting in that the species of *Drepanocarpus* and *Machaerium* are commingled into one key.

Another 13 names were assigned to *Drepanocarpus* before 1922 when Ducke (Arch. Jard. Bot. Rio de Janeiro 3: 151, 152. 1922) referred to it as a subgenus of *Machaerium*: "Il n'est pas possible de conserver le genre *Drepanocarpus*, on seulement parcequ'il ne représente qu'une forme du genre *Machaerium* adaptée à la dissémination par l'eau . . . , mais surtout à cause des formes intermédiaires entre les deux types de fruit qui, seule, ont servi à établir les deux genres." Concerning *M. leiophyllum* (DC.) Benth. he stated: "Cette espèce dont le fruit représente un premier degré de transition vers le type de celui du sousgenre *Drepanocarpus*." Two species were cited with indications of their referral to the subgenus, "*Machaerium* (*Drepanocarpus*) *frondosum* (Mart.) Ducke, n. comb!" and "*Machaerium* (*Drepanocarpus*) *macrocarpum* Ducke n. sp."

In 1925 (Arch. Jard. Bot. Rio de Janeiro 4: 1-342), in a paper on the legumes of the State of Pará, Brazil, Ducke treated Drepanocarpus as a synonym of Machaerium without designation as a sub-genus, with no explanation except to reiterate that the species with alate fruit were destined for dissemination by wind and those of the old genus Drepanocarpus by water.

Since Ducke's time, with few exceptions, authors have accepted the realistic reduction of Drepanocarpus to synonymy under Machaerium.

Three other generic names are synonymous with Drepanocarpus and, therefore, Machaerium: Sommerfeldtia Schum. & Thonn., published in 1828, with one species, S. obovata, a synonym of M. lunatum (L.f.) Ducke; Nephrosis Mich. ex DC. and Orucaria Juss. ex DC. The latter two were herbarium names cited as synonyms under Drepanocarpus, each with one species also synonymous with M. lunatum.

Fossil Names

At least 11 species of fossil Machaerium and five of Drepanocarpus have been described from Tertiary and Quaternary formations. Of these, four species of Machaerium and one of Drepanocarpus are from South America within the present range of the combined genus, Machaerium. Seven species of Machaerium and four of Drepanocarpus have been described from Europe, a somewhat questionable area of origin. In addition, the modern species, M. quinata (Aubl.) Sandw., as M. ferrugineum, has been cited from the Miocene of Bavaria !

On the basis of the illustrations I have seen, I hesitate to endorse any of the determinations. In the genus Machaerium, including Drepanocarpus, there is such variability in leaflet size, shape, and venation pattern that it is difficult even to recognize sterile modern material unless one is already well acquainted with the species.

The following citations, mostly obtained from the card file in the Paleobotany Laboratory of the Smithsonian Institution, are listed here chiefly to avoid possible repetition of the names for new species, either fossil or modern. Unfortunately, the list may be incomplete because maintenance of this file has been discontinued.

Fossil *Machaerium* from South America:

M. acreanum Maury, Min. Agr. Serv. Geol. & Min., Rio de Janeiro, Bol. 77: 20, fig. 8. 1937. Brazil, Acre, upper Rio Juruá. Pliocene.

M. eriocarpoides Engelhardt, Sitz. Naturw. Gesell. Isis, Dresden, Abh. 1: 8, pl. 1, fig. 28. 1894. Bolivia, Cerro do Potosí. Quaternary.

M. milleri Berry, Proc. U. S. Nat. Mus. 54: 147, pl. 17, fig. 7. 1917. Bolivia, Potosí. Pliocene.

M. premuticum Berry, Johns Hopkins Univ. Studies Geol. n° 12: 85, pl. 16, fig. 1. 1937. Brazil, Acre, upper Rio Juruá. Pliocene.

Fossil *Drepanocarpus* from South America:

D. franckei Engelhardt, Sitz. Naturw. Gesell. Isis, Dresden, Abh. 1: 7, pl. 1, figs. 36-38. 1894. Bolivia, Cerro do Potosí. Quaternary.

Fossil *Machaerium* from Europe:

M. budense Stur in Staub. Jahrb. k. Ung. Geol. Anst. 214. 1885 (1887), nom. nud. Hungary, Budapest. Oligocene.

M. eulefeldi Engelhardt, Abh. Grossh. Hess. Geol. Landesanst. Darmstadt 5: 311, pl. 17, fig. 6. 1914. Thuringia, Altenschlirf in Bogelsberg. Tertiary.

M. ferrugineum Persoon, L. Hofmann, Verhandl. Geol. Bundesanst., n° 4: 95. 1932. So. Bavaria, Salzach. Miocene.

M. kahlenbergi Friedrich, Abh. Geol. Specialk. Preuss 4 (3): 399 (241), pl. 31, figs. 7-9. 1883. Saxony, Trotha. Oligocene.

M. muticoides Engelhardt, Abh. Hess. Geol. Landesanst. Darmstadt 7(4): 113, pl. 38, fig. 4. 1922. Hesse, Messel bei Darmstadt. Lower Tertiary.

M. palaeogaeum Ettingshausen, Denkschr. K. Akad. Wiss. 29 (Foss. Fl. Bilin. pt. 3): 59, pl. 55, fig. 24. 1869. Bohemia, Kutschlin. Miocene.

M. tenuinervium Pim, cited in Flora U.S.S.R. 13: 294. 1972, English translation. "In Sarmatian deposits of the Black Sea area (Amvrosievka)".

M. trioptolemaeoides Massalongo, Syn. Fl. Foss. Senog. 130. 1858 (for *Cassia berenices*, ex parte).

Fossil *Drepanocarpus* from Europe:

D. bolcensis Unger, Sitzungsab. K. Acad. 18: 31, pl. 1, fig. 2. 1855. Carinthia, Prevali. Eocene.

D. decampii (Massalongo) Massalongo, Atti R. Ist. Veneto Sci. 3 (3): 770. 1858. ("*Robinia*"). Italy, Monte Bolca. Eocene.

D. nummus (Massalongo) Massalongo, Atti R. Ist. Veneto Sci. 3 (3): 771. 1858. ("*Pterocarpus*"). Italy, Monte Bolca. Eocene.

D. punctulatus Saporta, Schimper, Pal. Veg. 3: 363, pl. 54, fig. 34. 1874. Italy, Chiavon. Oligocene.